vehicle, a set optimum route of travel to a destination are displayed with the bird's eye view shown in FIG. **3**.

FIG. **5** is a schematic circuit block diagram of the apparatus for navigating the vehicle using the display unit in a first preferred embodiment according to the present invention.

FIG. **6** is an operational flowchart for explaining an operation of the navigating apparatus shown in FIG. **5**.

FIG. **7** is an operational flowchart for explaining a subroutine of a step S5 in FIG. **6**.

FIG. **8** is an explanatory view for explaining a displayed image on a display image screen in the case of the first embodiment.

FIG. **9** is an explanatory view for explaining the displaying method executed in the subroutine of the step S5 in FIG. **7**.

FIG. **10** is an operational flowchart of the navigating apparatus in a second preferred embodiment according to the present invention.

FIG. **11** is an explanatory view of an example of the displayed image screen of the bird's eye view in the case of the second embodiment shown in FIG. **10**.

FIG. **12** is an operational flowchart of a subroutine of a step S5 in FIG. **6** in a case of a third preferred embodiment of the vehicular navigating apparatus according to the present invention.

FIG. **13** is an explanatory view for explaining a positional relationship between a viewing point and the present position of the vehicle in the case of the third preferred embodiment shown in FIG. **12**.

FIG. **14** is an explanatory view for explaining a relationship between a direction of a line of sight and a range of the road map displayed on the display unit in the case of the third embodiment.

FIG. **15** is a schematic circuit block diagram of the vehicular navigating apparatus in a case of a fourth preferred embodiment according to the present invention.

FIGS. **16A** and **16B** are integrally an operational flowchart for explaining the operation of the navigating apparatus in the case of the fourth embodiment shown in FIG. **15**.

FIG. **17A** is an explanatory view of the bird's eye view in which a displayed color of grid lines is the same as that of a road having a low priority order of displayed color.

FIG. **17B** is an explanatory view of the bird's eye view in which a plurality of dots are painted over the road map in a modification of the fourth embodiment.

FIG. **18** is an explanatory view of an example of a gradation of a background of the road map.

FIG. **19** is an explanatory view of an example of another gradation of a background scenery of the road map.

FIGS. **20A** and **20B** are integrally an operational flowchart of a display control program of the road map as a modification of the fourth embodiment shown in FIGS. **16A** and **16B**.

FIG. **21** is an explanatory view for explaining a displayed example in the case of the fourth embodiment in which the gradations are applied to the background scenery.

FIG. **22** is a schematic circuit block diagram of the vehicular navigating apparatus in a fifth preferred embodiment according to the present invention.

FIG. **23** is an explanatory front view of a display panel in the case of the fifth embodiment shown in FIG. **22**.

FIGS. **24A**, **24B**, and **24C** are sequentially explanatory views for explaining a series of operations for a joystick **10** shown in FIG. **22**.

FIG. **25** is an operational flowchart for explaining an operation of a CPU shown in FIG. **22**.

FIG. **26A** is an explanatory view of a three-dimensional coordinate system for explaining a movement of a viewing point in the case of the fifth embodiment shown in FIG. **22**.

FIG. **26B** is an explanatory view of a three-dimensional coordinate system for explaining a movement of a tip of a line of sight vector in a sixth preferred embodiment according to the present invention.

FIGS. **27A** through **27E** are explanatory views of the three-dimensional coordinate system for explaining movements of the viewing point and line of sight direction in a seventh preferred embodiment according to the present invention.

FIG. **28** is an explanatory view of a display panel with a joystick omitted for explaining an alternative of the fifth, sixth, seven, and eighth embodiments of the vehicular navigating apparatus.

BEST MODE CARRYING OUT THE INVENTION

Reference will hereinafter be made to the drawings in order to facilitate a better understanding of the present invention.

Before explaining first, second, third, fourth, fifth, sixth, and seventh preferred embodiments of an apparatus and method for navigating a vehicle with a display unit according to the present invention, a basic concept of the invention will be described with reference to FIGS. **3A**, **3B** and **4**.

FIG. **3A** and **3B** show explanatory views for explaining a bird's eye view (E) from a predetermined position on an upper sky looking down to a road map as a viewing point to which the present invention is applicable.

The bird's eye view display is carried out as if the road map were viewed from an upper sky looking down thereof and is widely used in, for example, a flight simulation.

In FIG. **3A**, a plane M denotes a road map and a rectangular shape a, b, c, and d denotes a displayed range through a display unit **5**. Suppose that, in FIGS. **3A** and **3B**, a viewing point (E) is set on a position as shown in FIGS. **3A** and **3B**. The range of road map which can be viewed through the rectangular shape a, b, c, and d corresponds to a trapezoid region A, B, C, and D shown in FIGS. **3A** and **3B**. That is to say, from the position of the viewing point, a map data whose range is considerably wider than that of the rectangular shape a, b, c, and d can be viewed. In this way, the bird' eye view is displayed on the display image screen of the display unit **5** as if the shown trapezoid region A, B, C, and D were seen on its image from the position of the viewing point E of FIGS. **3A** and **3B**.

FIG. **4** shows an example of the display of the bird's eye view on the road map surrounding an optimally set route of travel from the present position of the vehicle to the destination (a position of the road map to which the vehicle is finally to reach).

As shown in FIG. **4**, the viewing point (E) is placed at the predetermined position of the upper sky in a direction opposite to the set destination and from the viewing point (E) thus placed, a destination direction is looked down through its line of sight. When the viewing point is placed at such a position as described above, an image such that a reduction scale percentage of the road map is continuously increased as the eye is approached nearly from the destination to the present position of the vehicle can be displayed as shown in FIG. **4**. That is to say, the optimally set route of